DATA SHEET

TDA2613
6 W hi-fi audio power amplifier

Product specification
File under Integrated circuits, IC01

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Philips Semiconductors

PHILIPS

GENERAL DESCRIPTION

The TDA2613 is a hi-fi audio power amplifier encapsulated in a 9-lead SIL plastic power package. The device is especially designed for mains fed applications (e.g. tv and radio).

Features

- Requires very few external components
- Input muted during power-on and off (no switch-on or switch-off clicks)
- Low offset voltage between output and ground
- Hi-fi according to IEC 268 and DIN 45500
- Short-circuit-proof
- Thermally protected.

QUICK REFERENCE DATA

Supply voltage range	V_P		15 to 42	V
Output power at THD = 0,5%,				
V_P = 24 V	P_o	typ.	6	W
Voltage gain	G_v	typ.	30	dB
Supply voltage ripple rejection	SVRR	typ.	60	dB
Noise output voltage	$V_{no(rms)}$	typ.	70	μV

PACKAGE OUTLINE

TDA2613: 9-lead SIL; plastic power (SOT110B); SOT110-1; 1996 August 07.

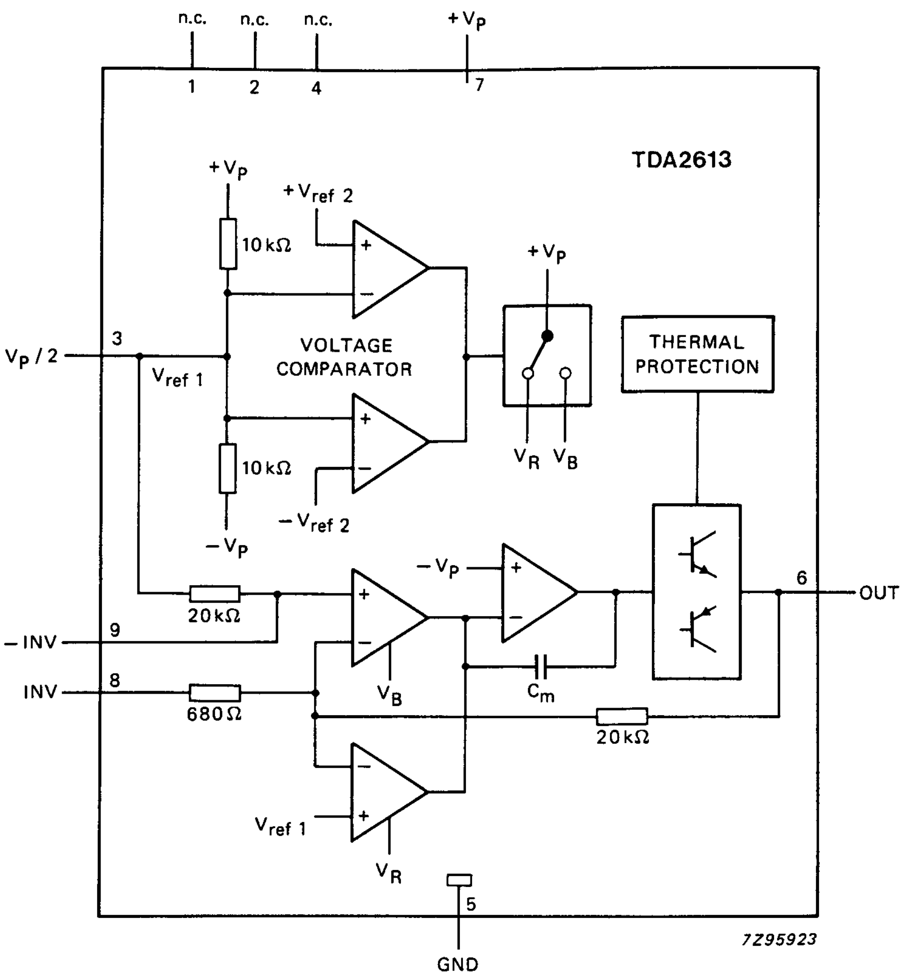


Fig.1 Block diagram.

PINNING

1.	n.c.	not connected
2.	n.c.	not connected
3.	$V_P/2$	$\frac{1}{2}$ V_P (asymmetrical) or ground (symmetrical)
4.	n.c.	not connected
5.	GND	ground (asymmetrical) or negative supply (symmetrical)
6.	OUT	output
7.	$+V_P$	positive supply
8.	INV	inverting input
9.	–INV	non-inverting input

FUNCTIONAL DESCRIPTION

This hi-fi power amplifier is designed for mains fed applications. The device is intended for asymmetrical power supplies, but a symmetrical supply may also be used. An output power of 6 watts (THD = 0,5%) can be delivered into an 8 Ω load with an asymmetrical power supply of 24 V.

The gain is fixed internally at 30 dB. Internal gain fixing gives low gain spread.

A special feature of this device is a mute circuit which suppresses unwanted input signals during switching on and off. Referring to Fig.4, the 100 µF capacitor creates a time delay when the voltage at pin 3 is lower than an internally fixed reference voltage. During the delay the amplifier remains in the DC operating mode but is isolated from the non-inverting input on pin 9.

Two thermal protection circuits are provided, one monitors the average junction temperature and the other the instantaneous temperature of the power transistors. Both protection circuits activate at 150 °C allowing safe operation to a maximum junction temperature of 150 °C without added distortion.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

PARAMETER	CONDITIONS	SYMBOL	MIN.	MAX.	UNIT
Supply voltage		V_P	–	42	V
Non-repetitive peak output current		I_{OSM}	–	4	A
Total power dissipation	see Fig.2	P_{tot}			
Storage temperature range		T_{stg}	–55	+ 150	°C
Junction temperature		T_j	–	150	°C
Short-circuit time: outputs short-circuited to ground (full signal drive)	see note	t_{sc}	–	1	hour

Note to the Ratings

For asymmetrical power supplies (at short-circuiting of the load) the maximum supply voltage is limited to V_P = 28 V. If the total internal resistance of the supply (R_S) ≥ 4 Ω, the maximum unloaded supply voltage is increased to 32 V. For symmetrical power supplies the circuit is short-circuit proof to V_P = ± 21 V.

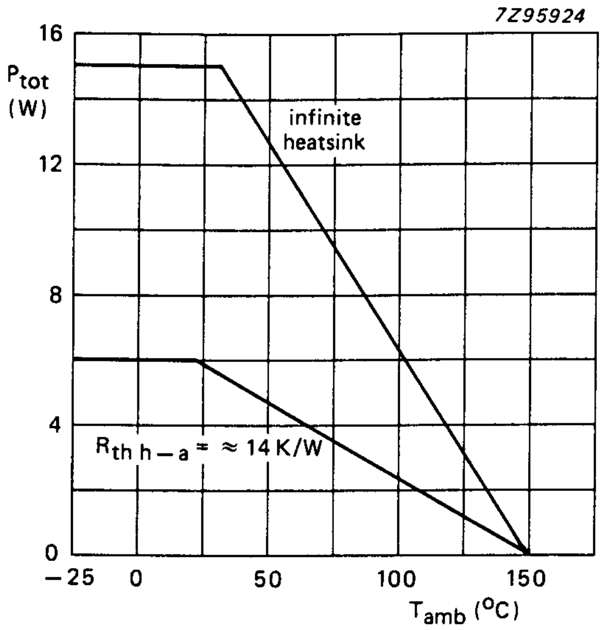


Fig.2 Power derating curve.

THERMAL RESISTANCE

From junction to case $R_{th\ j\text{-}c}$ = 8 K/W

HEATSINK DESIGN EXAMPLE

With derating of 8 K/W, the value of heatsink thermal resistance is calculated as follows:
given R_L = 8 Ω and V_P = 24 V, the measured maximum dissipation is 4,1 W; then, for a maximum ambient temperature of 60 °C, the required thermal resistance of the heatsink is:

$$R_{th\ h\text{-}a} = \frac{150 - 60}{4,1} - 8 \approx 14 \text{ K/W}$$

Note: The metal tab (heatsink) has the same potential as pin 5 (GND).

CHARACTERISTICS

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage range						
operating mode		V_P	15	24	42	V
input mute mode		V_P	4	–	10	V
Repetitive peak output current		I_{ORM}	2.2	–	–	A
Operating mode: asymmetrical power supply; test circuit as per Fig.4; V_P = 24 V; R_L = 8 Ω; T_{amb} = 25 °C; f = 1 kHz						
Total quiescent current		I_{tot}	10	20	35	mA
Output power	THD = 0,5%	P_o	5	6	–	W
	THD = 10%	P_o	6,5	8,0	–	W
Total harmonic distortion	P_o = 4 W	THD	–	0,15	0,2	%
Power bandwidth	THD = 0,5%; note 1	B	–	20 to 16 k	–	Hz
Voltage gain		G_v	29	30	31	dB
Noise output voltage (r.m.s. value); unweighted (20 Hz to 20 kHz)	R_S = 2 kΩ	$V_{no(rms)}$	–	70	140	μV
Input impedance		$\|Z_i\|$	14	20	26	kΩ
Supply voltage ripple rejection	note 2	SVRR	35	44	–	dB
Input bias current		I_{ib}	–	0,3	–	μA
DC output offset voltage	with respect to V_P/2	V_{os}	–	30	200	mV
Input mute mode: asymmetrical power supply; test circuit as per Fig.4; V_P = 8 V; R_L = 8 Ω; T_{amb} = 25 °C; f = 1 kHz						
Total quiescent current		I_{tot}	5	15	20	mA
Output voltage	V_i = 600 mV	V_{out}	–	2,0	2,8	mV
Noise output voltage (r.m.s. value); unweighted (20 Hz to 20 kHz)	R_S = 2 kΩ	$V_{no(rms)}$	–	70	140	μV
Supply voltage ripple rejection	note 2	SVRR	35	55	–	dB
DC output offset voltage	with respect to V_P/2	V_{os}	–	40	200	mV

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating mode: symmetrical power supply; test circuit as per Fig.3; $V_P = \pm 12$ V; $R_L = 8\ \Omega$; $T_{amb} = 25$ °C; f = 1 kHz						
Total quiescent current		I_{tot}	10	20	35	mA
Output power	THD = 0,5%	P_o	5	6	–	W
	THD = 10%	P_o	6,5	8,5	–	W
Total harmonic distortion	$P_o = 4$ W	THD	–	0,13	0,2	%
Power bandwidth	THD = 0,5% note 1	B	–	40 to 16 k	–	Hz
Voltage gain		G_v	29	30	31	dB
Noise output voltage (r.m.s. value); unweighted (20 Hz to 20 kHz)	$R_S = 2\ k\Omega$	$V_{no(rms)}$	–	70	140	μV
Input impedance		$\|Z_i\|$	14	20	26	kΩ
Supply voltage ripple rejection		SVRR	40	60	–	dB
DC output offset voltage	with respect to ground	V_{os}	–	30	200	mV

Notes to the characteristics

1. Power bandwidth at $P_{o\ max}$ –3 dB.
2. Ripple rejection at $R_S = 0\ \Omega$, f = 100 Hz to 20 kHz; ripple voltage = 200 mV (r.m.s. value) applied to positive or negative supply rail.

APPLICATION INFORMATION

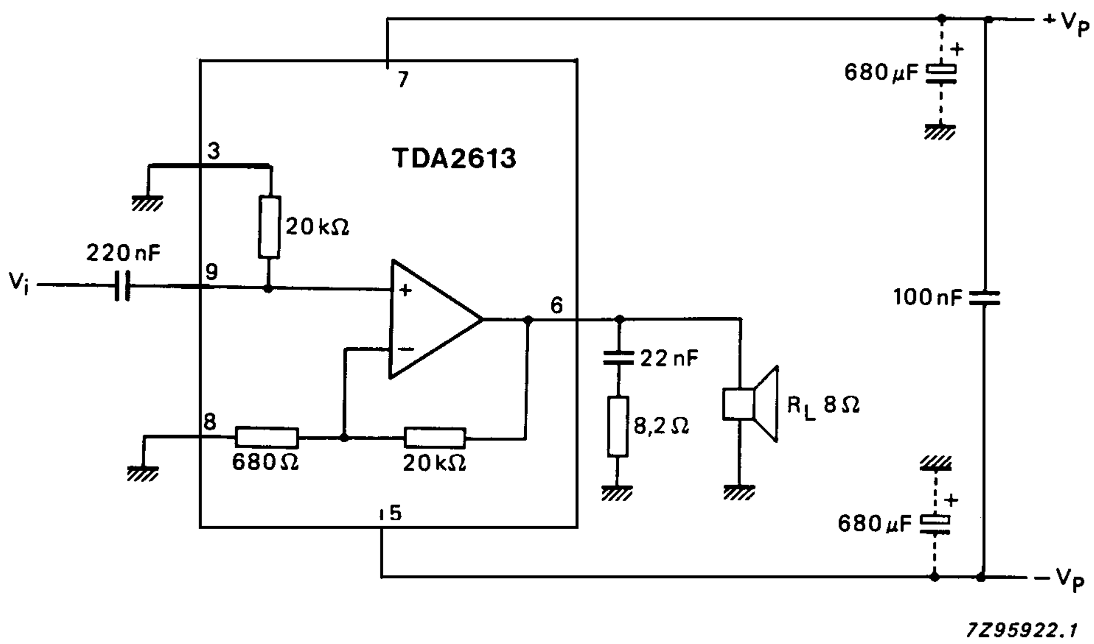


Fig.3 Test and application circuit; symmetrical power supply.

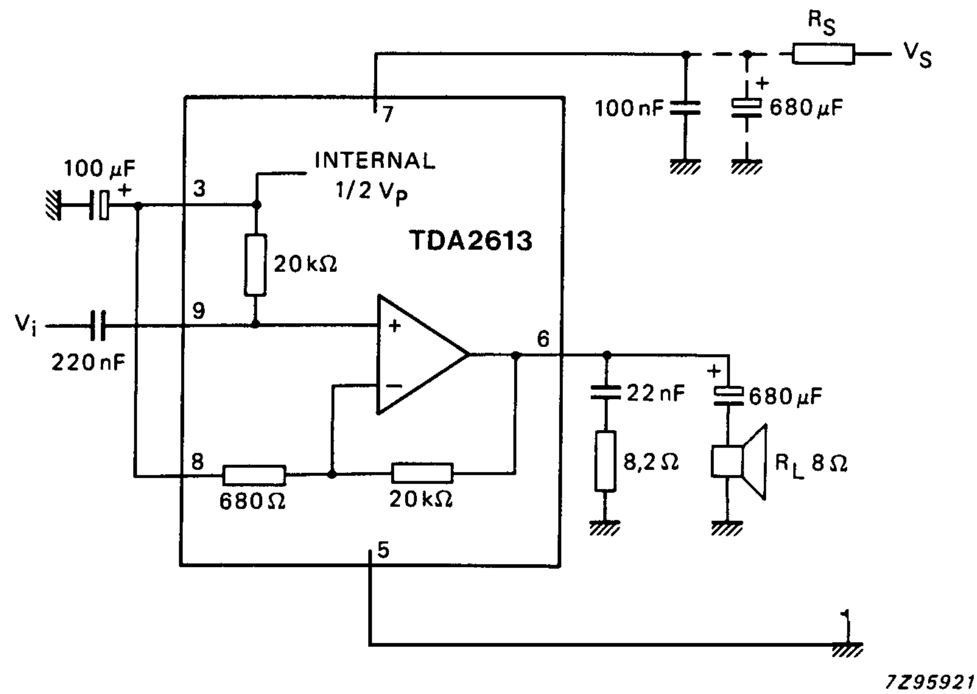


Fig.4 Test and application circuit; asymmetrical power supply.

Input mute circuit

The input mute circuit operates only during switching on and off of the supply voltage. The circuit compares the $\frac{1}{2}$ supply voltage (at pin 3) with an internally fixed reference voltage (V_{ref}), derived directly from the supply voltage. When the voltage at pin 3 is lower than V_{ref} the non-inverting input (pin 9) is disconnected from the amplifier. The voltage at pin 3 is determined by an internal voltage divider and the external 100 μF capacitor.

During switching on, a time delay is created between the reference voltage and the voltage at pin 3, during which the input terminal is disconnected, (as illustrated in Fig.5).

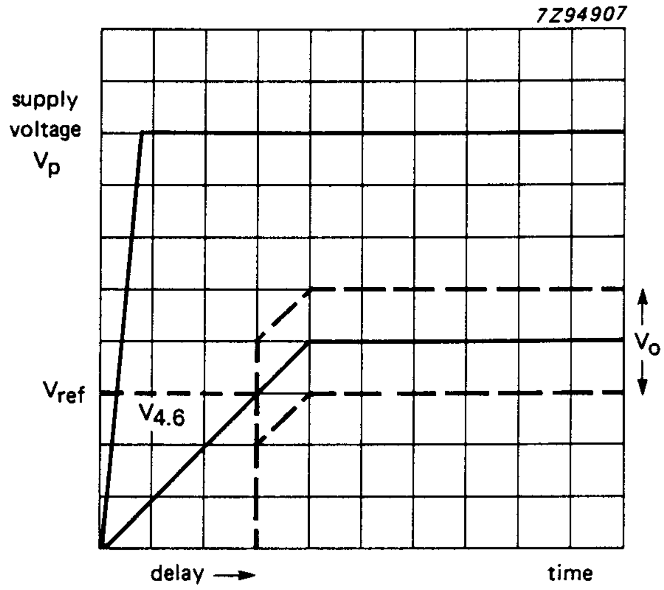
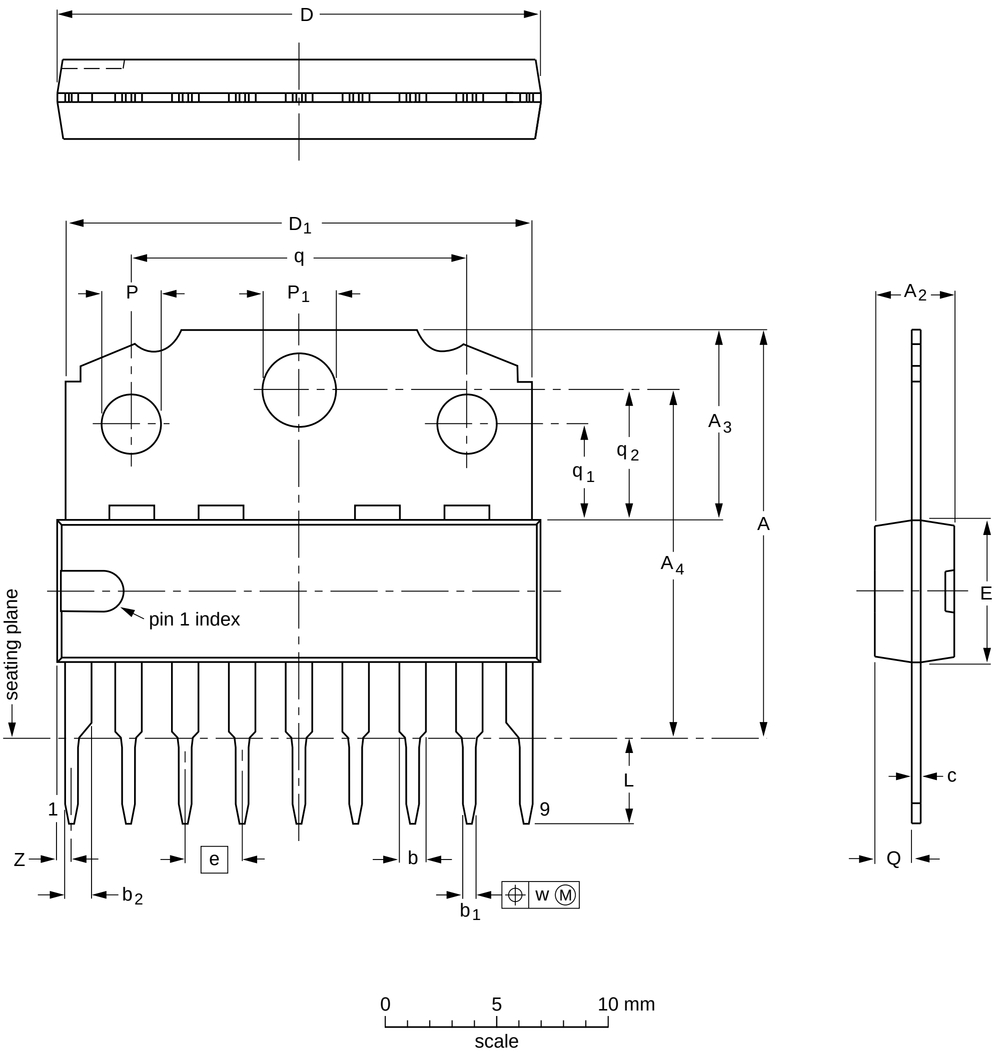


Fig.5 Input mute circuit; time delay.

PACKAGE OUTLINE

SIL9MPF: plastic single in-line medium power package with fin; 9 leads **SOT110-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_2 max.	A_3	A_4	b	b_1	b_2	c	$D^{(1)}$	D_1	$E^{(1)}$	e	L	P	P_1	Q	q	q_1	q_2	w	$Z^{(1)}$ max.
mm	18.5 17.8	3.7	8.7 8.0	15.8 15.4	1.40 1.14	0.67 0.50	1.40 1.14	0.48 0.38	21.8 21.4	21.4 20.7	6.48 6.20	2.54	3.9 3.4	2.75 2.50	3.4 3.2	1.75 1.55	15.1 14.9	4.4 4.2	5.9 5.7	0.25	1.0

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT110-1						~~92-11-17~~ 95-02-25

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *“IC Package Databook”* (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.